

Cultural Heritage Management of Historical Centers: the Old Town of Rethymno, Crete, Greece

Sophia Topouzi¹, Apostolos Sarris² and Charalambos Flouris³

Institute for Mediterranean Studies, Foundation for Research and Technology, Hellas (F.O.R.T.H.)
130 Nikiforou Foka str., GR-74100 Rethymno, Greece

[1stopouzi@arch.uoa.gr](mailto:stopouzi@arch.uoa.gr), [2asaris@ret.forthnet.gr](mailto:asaris@ret.forthnet.gr), [3flouris@admin.forth.gr](mailto:flouris@admin.forth.gr)

Abstract. The known history of the Old Town of Rethymno, Crete goes back to the Venetian period. From the beginning of the 20th century a number of construction interventions changed the appearance of several buildings of the town. Recently the Municipality of Rethymnon has created a special department for monitoring the numerous development works within the old town. In collaboration with the abovementioned department, the Institute for Mediterranean Studies – F.O.R.T.H. has developed a relational database and a Geographical Information System for the documentation, protection and preservation of the buildings of the Old Town of Rethymno. The final product can be used by the Municipality of Rethymno, the local Department of Antiquities and individual researchers and it can be considered as a pilot system for the management of the cultural resources of the historical centers within an urban environment.

Key words : Rethymno, Historical Centers, GIS, Digital Cadastre

1 Introduction

1.1 History of the town

Rethymno is located at the southeastern part of the Mediterranean Sea, on the northwest coast of the island of Crete, Greece. Habitation in the area begins during the Neolithic period. Although some tombs, dated to the Minoan period, have been found in the area of the modern town of Rethymno (Kalokyris 1998, Malagari – Stratidakis 1995), the limits of the Minoan settlement have not been detected until today. However the hill of the Venetian Fortezza is known by the toponym “Palaeokastro”, meaning the “Ancient Castle” (Steriotou 1979, vol. I:14).

The first mention of the town called “Rithymna” appears in the 4th century B.C., when the town mints coins with the symbol of dolphins. The town is also mentioned at the sanctuary of Delphoi (Malagari – Stratidakis 1995:8).

From the Byzantine period and the Arab occupation little is known. However when the Venetians take over the area, they refer to Rethymno as “Castrum Rettimi” (Dimakopoulos 1977:19, Steriotou 1979, vol. I:20), which indicates the existence of a fortified town here. This should be the “Castel Vecchio” used by the Venetian until 1571, when 1591 out of the 3091 houses and all of the fortifications of the town were destroyed by an attack of the ottoman fleet. After this incident the town’s buildings and fortifications have been rebuilt. The town’s plan has remained more or less unchanged since then (Steriotou 1979: 153).

On September 29th 1646, after a 22-day siege, the town and its Fortezza fall into the hands of the Ottomans. No significant change has been made to the town’s plan, with the exception of converting the Christian churches into mosques, which demanded the building of some minarets. Some private homes have also been built on the coastal road, the Venetian “Sabbionara” (Dimakopoulos 1977).

In the beginning of the 20th century the town’s walls started to collapse. The town’s need to expand was made rather obvious. The town and its historical monuments were subjected to a large

number of destructions (an example is the demolition of the tower of the Venetian solar watch) making the need of a cultural resources management plan an urgent matter for the preservation of the historical center of the town.

1.2 Urban Planning : a digital approach

Today Rethymno is divided in the Old and the New Town. The New Town is constantly subjected to construction interventions. On the other hand, for the last couple of decades, the Old Town has been protected by a number of actions in order to preserve unalterable its cultural character. In addition to that, a few years ago the Municipality of Rethymno created a special department¹ in order to monitor the construction interventions and make specific suggestions to preserve the Venetian and Ottoman monuments.

As a result of its’ collaboration with the Municipality, the Laboratory of Geophysical-Satellite Remote Sensing and Archaeo-environment of the Institute for Mediterranean Studies – F.O.R.T.H. has undertaken the task to create an electronic operating system consisting of a database and a Geographical Information System. The system is going to be used a) to register the Old Town’s buildings and their architectural characteristics, the relevant construction interventions and the corresponding permits and b) to spatially visualize all the available information on the topographical background of the town.

A number of similar examples are well-known in international level (Bernades et al. 1996, Bianchini 2001, Boerner 2001, Boerner 2002, Campagna 2001, Campagna et al. 2002). However the case of the Old Town of Rethymno is a unique example of digital heritage management in Greece, offering a number of proposals for the expansion of such a system in other historical “neighbourhoods” of the Mediterranean.

¹ Acknowledgements : The authors would like to thank S.Kelekis, M.Iliaki and M.Kotsifi (Municipality of Rethymnon) for their collaboration throughout the entire project.

2 Creation of the Database

The database, which is designed to work both individually and in consistency with the Geographical Information System, in such a way as to meet the needs of the employees of the Municipality's Old Town Department, contains information about the building blocks and plots, the architectural characteristics and the owners of the buildings, photos and designs of them, and relevant bibliography, regarding their historical context. Information about the roads and the construction works and interventions within the limits of the Old Town is also included.

The design of the database, consisted of entities and relationships between them according to the E/R model, was transformed into MS ACCESS tables. "Tab-control forms", allowing forms with multiple pages, were introduced to encounter the problem of the large number of inter-related data. Finally, the final product was designed as a double-leveled operating system in order to provide limited access to unauthorized users. First level access is limited to authorized users, who can either enter, update and delete data or perform predefined queries (fig. 1). After updating the different fields, data can be exported to the geographic database of the GIS. In a second level, access is allowed to all users, mainly for performing predefined queries and printing their results.

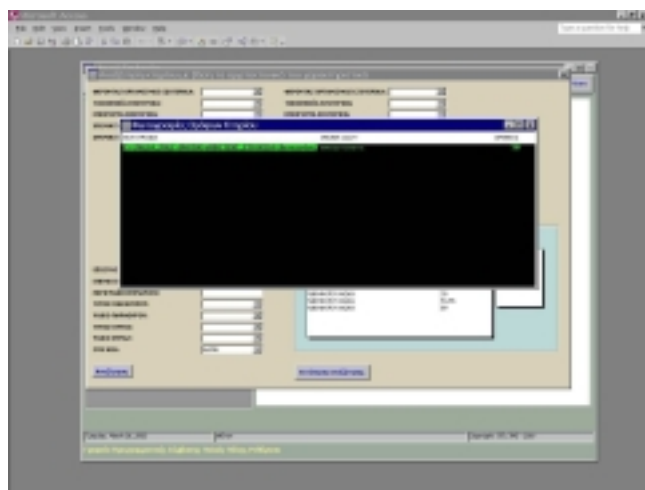


Fig. 1. Query form from the database

In order to test the functionality of the system a number of entries, based on published bibliography for the Venetian and Ottoman buildings in Rethymno (Dimakopoulos 1977), was performed. Information about more than a thousand buildings of the Old Town of Rethymno is expected to be entered in the database by the Municipality's Old Town Department.

3. Geographical Information System

The specific Geographical Information System contains data in both vector and raster form. All data are transformed in the same geodetic reference system, the Hellenic Geodetic Reference System 1987 (EGSA '87), which is used by the National Cadastre of Greece. The GIS can either be used singularly or in significance with the database.

3.1 Rasters

The rasters used in the specific GIS were the Digital Elevation Model of the wider area of Rethymno, an Ortho SPOT satellite image with 10×10m resolution and aerial images (of different scales and dates).

The Digital Elevation Model (DEM) of the area was created by digitized contours (elevation 4 meters) and topographical points, provided by topographical maps (scale 1:5000)². The method used was the "Minimum Curvature", which combines contours and points with the optimum result. Furthermore, a second terrain model was used, created with the TIN option of the ESRI-ArcView, in order to be used in the 3D simulations.

The satellite and the aerial images of different dates have been used to monitor the changes in the urban planning.

All rasters (fig. 2) were geometrically corrected into the same geodetic system, EGSA '87³, so that they can be used in combination with the vectors included in the system.



Fig. 2. Georeferenced aerial images from different chronological periods, superimposed on the ortho satellite image from SPOT

3.2 Vectors

Topographical maps from the National Cadastre of Rethymno (scale 1:1000)⁴ were digitized in order to create the digital background of the town. Blocks, building plots and buildings were digitized as polygons and roads as lines (fig. 3). To each feature an ID-number was assigned according to the National Cadastre of Greece. The ID-number allowed the identification of every

² Provided by the Greek Geographical Service of the Army.

³ The EGSA '87 is the Geodetic Reference System used by the National Cadastre of Greece.

⁴ Provided by the Municipality's Old Town Department.

different building and the connection to the data contained in the database. This way an advanced user can perform queries in order to search for buildings with specific characteristics and get as a result a thematic map combined with a table, which contains the relevant information.

periods were 3-dimensionally recreated (fig. 5). In addition, the buildings inside the Fortezza were raised to a specified height, giving the ability to the user to perform virtual tours in the area (fig. 6).



Fig. 3. Digitized topographical map of the Old Town of Rethymno, consisting of the coastline, roads, blocks, building plots and buildings.

The final result was the creation of thematic maps according to architectural characteristics or chronological periods. Thus the Venetian monuments were separated from the Ottoman ones and spots of interest were indicated to the user. By clicking on the indicated spots, the user can see information (photos and text) about the specific monument.

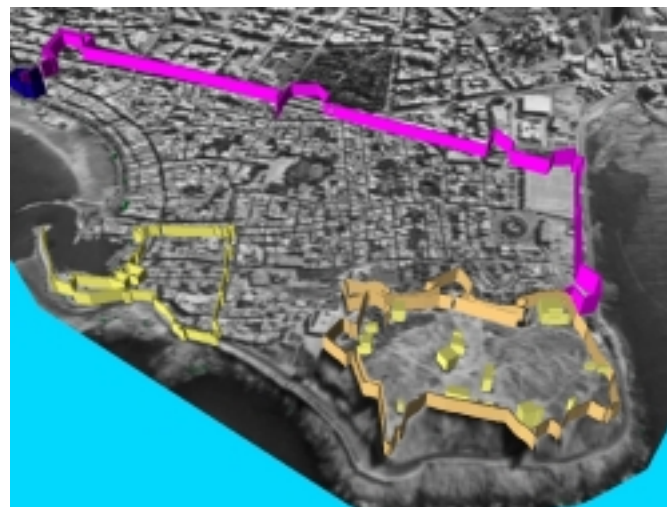


Fig. 5. The Byzantine, Venetian and Ottoman fortifications of Rethymno, visualized by the combination of rasters and vectors in 3-dimensional mode.



Fig. 4. Thematic map of the Venetian monuments in the Old Town of Rethymno. Photo and text information about the Venetian Fortezza.

3.3 3D Visualization

Using the DEM, draped by the most recent aerial photo, a 3D model of the area was created. Using information from the published bibliography (Steriotou 1979, Steriotou 1997) the location of the known fortifications of Rethymno from all chronological



Fig. 6. 3D visualization of the Venetian Fortezza and the enclosed buildings

Finally a third option is given to the advanced user of the system. A 3-dimensional map, which combines the Digital Elevation Model of the wider Rethymno area, the buildings raised in 3 dimensions according to the number of floors and the 3-dimensional recreation of the fortifications of the town, can be used to perform viewshed analysis in order to examine the coverage of the surrounding passages.

4 Conclusions

The paper is dealing with a demonstration project designed for the management of cultural heritage within the urban context of modern European cities. Although the problem is well defined due to the accelerated pace of construction works and the lack of preservation of the historical monuments of high historical value, the process of management of the historical resources has become a difficult task.

The particular system has tried to introduce a geographically registered database, which includes information related to the natural environmental settings, the historical monuments and buildings, and the real estate and public works monitoring. In this way, urban development can follow a specific line of action providing a strategic support in the preservation of monuments, along with a digital mapping product for the spatial distribution of them, accompanied by a number of related information related to the current "ownership" of the land or building, the preservation status, the re-development proposals, etc.

When fully in use, the operating system (consisted of the database and the GIS) can be used from many different users :

- The Municipality can use it to protect the monuments and monitor the construction interventions within the limits of the Old Town and to provide an interactive map with the sights of the town for tourists,
- The archaeological service can use it as an archive for the monuments of the town.
- Individual researchers can use it as a tool to locate topographic and architectural information for the Venetian and Ottoman monuments.

The system can be easily applied to other municipalities aiming at the management of the historical monuments within the urban environment of small or large town and cities. In the future, part of the database is planned to be installed in user-friendly interface in the internet, serving the geographically referenced information through a Web_GIS platform.

References

- BERNADES P. ET AL., 1996. Virtual Reality, Urban Planning and Historical Town Centres, at <http://www.ccg.pt/novidades/publicacoes/virtual96.pdf>
- BIANCHINI R., 2001. A GIS for the historical city of Harar in Ethiopia, Socio-Economic Research and Geographic Information Systems – The digital city : a Euroconference – Granada, Spain 9-14 June 2001, at <http://www.shef.ac.uk/~scgisa/granada/programme.htm>.
- BOERNER W., 2001. Vienna Archaeological GIS (VAGIS) : A Short Outline of a New System for the Stadtarchaeologie Wien, Computing Archaeology for Understanding the Past, CAA2000, Proceedings of the 28th Conference, Ljubliana April 2000, Stancic Z. & Veljanovski T. (eds.), BAR International Series 931: 149-152.
- BOERNER W., 2002. 2000 Years of Town Planning in Vienna, Archaeological Informatics : Pushing the Envelope, CAA2001, Proceedings of the 29th Conference, Gotland April 2001, Burenhult G. & Arvidsson J. (eds.), BAR International Series 1016 : 13-19.
- CAMPAGNA M., 2001. Virtual Info-Desk as support in urban re-development management : A case study on historical city centres, Socio-Economic Research and Geographic Information Systems – The digital city : a Euroconference – Granada, Spain 9-14 June 2001, at <http://www.shef.ac.uk/~scgisa/granada/programme.htm>.
- CAMPAGNA M., COLAVITTI A-M., DEPLANO G., 2001., The GIS support to sustainable re-development action management in archaeological-sensitive urban areas, Workshop 6 – Archaeologie und Computer, Vienna 5-6.9.2001, at http://www.arhaeologie-wien.at/workshop/papers_main_en.htm.
- DIMAKOPOULOS I., 1977. Ta spitia tou Rethymnou, Symvoli sti Meleti tis Anagennisiakis Architektonikis tis Kritis tou 16ou kai tou 17ou Aiona, Ministry of Culture (ed), Athens.
- HARRIS E.C., 2001. GIS and the future of archaeological recording, Workshop 6 – Archaeologie und Computer, Vienna 5-6.9.2001, at http://www.arhaeologie-wien.at/workshop/papers_main_en.htm.
- KALOKYRIS K., 1998. I Archaia Rithymna, 2nd edition, Mitos (ed).
- MALAGARI A. – STRATIDAKIS CH. 1995. Rethymno : Odigos gia tin Poli, 4th edition, Athens.
- STERIOTOU I., 1979. Oi Venetikes Ochyroseis tou Rethymnou (1540-1646), Symvoli sti Frouriaki Architektoniki tou 16ou kai 17ou Aiona, vol. I & II, Thessaloniki.
- STERIOTOU I., 1997. I Fortezza tou Rethymnou : I Amyna tis Polis tin Epochi tis Venetokratias , TAPA (ed), Athens.